



Canada-Manitoba

**FLOOD DAMAGE REDUCTION
PROGRAM**

Annual Report

1984-1985

November 1, 1985

CANADA-MANITOBA
FLOOD DAMAGE REDUCTION PROGRAM

ANNUAL REPORT
FOR
THE PERIOD
APRIL 1, 1984 TO MARCH 31, 1985

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CANADA — MANITOBA FLOOD DAMAGE REDUCTION PROGRAM

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Department of the Environment
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Minister
Department of Natural Resources
Winnipeg, Manitoba
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Gentlemen:

I am pleased to present the eighth Annual Report of the Canada-Manitoba Steering Committee on the Flood Damage Reduction Program. This report covers the work conducted and progress made during the period April 1, 1984 to March 31, 1985. This work is included in the program authorized by the Flood Damage Reduction Agreements signed by Canada and Manitoba on December 20, 1976 and by the Amending Agreement and Flood Forecasting Agreement signed on March 31, 1981. Further amendments were requested in the period of this report.

The year was highlighted by the designation of flood risk areas at the communities of Carman on June 13, 1984 and Lorette on September 13, 1984. In order to complete the work program, extensions in time of slightly more than three years were requested for the General, Mapping and Studies Agreements. As well, an additional \$160,000 was requested to complete the mapping program. This request was not approved during the period of this report. Accordingly, the Mapping Agreement expired on December 31, 1984.

Progress on hydrology and hydraulic studies for designation of flood risk areas was impeded during the period of this report because of the expiry of the Mapping Agreement. This will further delay designations in 1985-86 and beyond.

Progress on Phase II of the Flood Forecasting Agreement was on schedule within the funding and time remaining under that Agreement. During the reporting period, expenditures totaling \$274,515.19 were shared equally between Canada and Manitoba for flood risk mapping, flood damage reduction studies and flood forecasting work programs.

Yours truly

N. Mudry, P. Eng.
Chairman
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SUMMARY

Two flood risk area designations occurred in 1984-85. The area along the Boyne River in the Town of Carman and adjoining areas in the R.M. of Dufferin were designated on June 13, 1984. The area along the Seine River in the community of Lorette in the R.M. of Tache were designated on September 13, 1984. Public information maps showing the flood risk areas and brochures explaining the flood damage reduction program were distributed.

Work continued toward completion of the base mapping at three communities. These areas are the Town of The Pas, the Town of Virden and unmapped areas of the La Salle River within the City of Winnipeg.

A hydraulic study was completed for Arborg and studies were underway for Fisher Branch and Riverton. Preliminary flood lines were shown to the appropriate local councils to obtain their comments or concerns. However, following expiry of the Mapping Agreement on December 31, 1984, all flood risk mapping activities and plans for designations were suspended.

Some preliminary work has been completed for flood damage reduction studies at Elie, Morden and Riverton. Work continued on Phase II of the Flood Forecasting Agreement. Progress was made on modelling and model calibration of selected tributaries of the Assiniboine, Red and Souris river watersheds.

A total expenditure of \$274,515.19 was shared equally between Canada and Manitoba in 1984-85. Of this, \$129,596.96 was spent on flood risk mapping, \$26,568.60 on flood damage reduction studies and \$118,349.63 on flood forecasting.

CHAPTER I

THE CANADA-MANITOBA FLOOD DAMAGE REDUCTION AGREEMENTS

On December 20th, 1976, the Governments of Canada and Manitoba signed three agreements whose collective aim is to reduce the potential for flood damages in Manitoba over the long term. These agreements recognize that the best way to reduce potential flood damage is to keep flood prone development out of the floodplain. Protection of existing development could involve a combination of structural and non-structural alternatives, including allowing some flooding to occur once the potential for flooding has been identified.

I.1 Introduction

The eighth annual report reviews work activities and progress of the Canada-Manitoba Flood Damage Reduction Program during the period from April 1, 1984 to March 31, 1985.

I.2 General Agreement Respecting Flood Damage Reduction (FDR)

The General Agreement outlines the policies respecting government undertakings and programs in flood risk areas and provides a coordinated framework for a number of implementation sub-agreements. Listed below are the agreements which are presently in effect.

I.3 Agreement Respecting Flood Risk Mapping

This Agreement provides for a flood risk mapping program to determine and subsequently designate those urban areas within Manitoba that are prone to flooding. Appendix A lists "Areas and Floodways to be Mapped in the Province of Manitoba" as described in the original Mapping Agreement, including the additions and deletions incorporated in the

Amending Agreement (noted below). Provincial and federal Orders-in-Council were passed to add the main rivers in Winnipeg to the schedule of centres to be mapped. A public information program is to be conducted to inform people of the merits of the program, and to encourage acceptance and active participation.

I.4 Agreement Respecting Studies for Flood Damage Reduction

The Studies Agreement provides for studies in specific problem areas to determine the most suitable measures for reducing or mitigating the damaging effects of floods on existing developments.

I.5 Amending Agreement

In order to complete all the work scheduled in the Flood Risk Mapping Agreement and because of the need for additional funds, an amending agreement was negotiated between Canada and Manitoba during 1980/81. The major changes to the three flood damage reduction agreements were the extension of time and the increase in funding. The General Agreement was extended to December 31, 1990. The Mapping Agreement was extended to December 31, 1984 with additional funds of \$1,490,000. The termination date of the Studies Agreement was changed to December 31, 1985 with no additional funding. Beausejour was removed from the list of places to be mapped because no serious flood problem exists there. It was replaced by the Town of Gimli.

Further amendments were requested in the reporting period, since the termination date of the Mapping Agreement was December 31, 1984. Specifically, these proposed amendments were an extension to the General Agreement from December 31, 1990 to March 31, 1994, additional funding of \$160,000 and an extension to the Mapping Agreement from December 31, 1984 to March 31, 1988, and an extension to the Studies Agreement from December 31, 1985 to March 31, 1989.

I.6 Agreement Respecting Flood Forecasting

The Flood Forecasting Agreement, a sub-agreement to the General Agreement, was signed by Canada and Manitoba on March 31, 1981. The objective of the Agreement is to improve the flood forecasting capability for the Red, Assiniboine and Souris rivers in Manitoba.

This Agreement is divided into two phases. The first phase includes a pilot project on the Boyne River to develop a suitable improved streamflow forecasting model and to establish a Canada-Manitoba flood forecasting centre located in Winnipeg. The second phase, now underway, provides for the development of improved flood forecasting procedures for the Red, Assiniboine and Souris rivers.

I.7 Agreement Respecting the Upgrading of Ring-Dykes

An agreement to upgrade the ring-dykes at eight communities along the Red River was signed on March 10, 1983. This agreement provides up to \$4.5 million to raise existing ring-dykes at Emerson, Letellier, Dominion City, St. Jean Baptiste, Morris, Rosenort, Brunkild and St. Adolphe to withstand a 100-year flood. The federal government has agreed to fund 45 percent of the capital cost of the project while the Province is responsible for 55 percent. Ring dykes are the only practical measures to protect existing and future development in these communities. Flood waters spread out for many kilometres in the very flat valley and the alternative of diverting development to areas which are not flood prone does not exist.

Amendments to this agreement were requested in 1984/85. These proposed amendments consisted of an extension in time to March 31, 1989 and the provision of an additional \$1.6 million in funding for upgrading the dyking system at the Village of Ste. Rose du Lac and the dyke protecting the water treatment plant at the Town of Souris.

Negotiation of the Ring-Dykes Agreement was coordinated by the Steering Committee responsible for the Flood Damage Reduction Program. However, the Agreement is not part of that program and is managed and reported on to the ministers by an Implementation Committee.

CHAPTER II

PROGRAM ORGANIZATION

II.1 Introduction

Under the terms of the General Agreement, a Steering Committee was established consisting of two members appointed by the Minister of the Environment for Canada and two members appointed by the Minister of Natural Resources for Manitoba. The Steering Committee provides direction for the program and reports to the Ministers annually.

A Technical Committee on Flood Risk Mapping was established under the terms of the Flood Risk Mapping Agreement. This committee consists of two members appointed by the Minister of the Environment for Canada and two members appointed by the Minister of Natural Resources for Manitoba. It supervises and conducts the work program of the Mapping Agreement, and reports to the Steering Committee.

A Studies Sub-Committee was established in mid-1981 by the Steering Committee to oversee the work conducted under the Flood Damage Reduction Studies Agreement. This Sub-Committee consists of three members. The federal Co-Chairman of the Steering Committee appointed one member, while the provincial Co-Chairman of the Steering Committee appointed two members. The Chairman of the Studies Sub-Committee reports to the Steering Committee.

A Technical Sub-Committee on Flood Forecasting was established under the terms of the Flood Forecasting Agreement. It consists of two members appointed by the federal Co-Chairman of the Steering Committee and two members appointed by the provincial Co-Chairman. This committee supervises and undertakes the task of the Flood Forecasting Agreement and reports to the Steering Committee.

II.2 Membership: Steering Committee

The membership of the Steering Committee at the beginning of 1984/85 was as follows:

Canada

Mr. D. A. Davis (Co-Chairman)
Regional Director
Inland Waters Directorate
Western and Northern Region
Environment Canada
Regina, Saskatchewan

Mr. R. L. Pentland
Director
Water Planning and Management
Inland Waters Directorate
Environment Canada
Ottawa, Ontario

Manitoba

Mr. N. Mudry (Co-Chairman)
Chief of Water Management
Water Resources Branch
Department of Natural Resources
Winnipeg, Manitoba

Mr. J. N. Whiting
Director
Municipal Planning Branch
Department of Municipal Affairs
Winnipeg, Manitoba

In accordance with guidelines established in the General Agreement, the chairmanship alternated back to the federal side of the Steering Committee during the eighth year of the program. Mr. Davis served as chairman at two of the meetings held in Winnipeg during the report year. Mr. Davis temporarily left the committee on a training assignment in October, 1984. Mr. R. A. Halliday replaced Mr. Davis as the member from Environment Canada, Inland Waters Directorate, Western and Northern Region. Mr. Mudry chaired the third meeting in Winnipeg. Mr. H. Foerstel of Environment Canada, Ottawa, attended one meeting in place of Mr. Pentland. Mr. G. Felton of Environment Canada, Inland Waters Directorate, Western and Northern Region, acted as secretary for the meetings.

II.3 Membership: Technical Committee on Flood Risk Mapping

The following was the membership of the Technical Committee at the beginning of 1984/85:

Canada

Mr. H. Naik (Co-Chairman)
Senior Water Resources Planner
Water Planning and Management Branch
Western and Northern Region
Environment Canada
Regina, Saskatchewan

Mr. J. R. R. Gauthier
Head
Data Acquisition and Program
Planning Group
Topographical Survey Directorate
Energy, Mines and Resources Canada
Ottawa, Ontario

Manitoba

Mr. F. P. Barlisen (Co-Chairman)
Head
Flood Damage Reduction Section
Water Resources Branch
Department of Natural Resources
Winnipeg, Manitoba

Dr. H. Moniwa
Chief
Topographic Mapping Section
Surveys and Mapping Branch
Department of Natural Resources
Winnipeg, Manitoba

Mr. D. Anderson replaced Mr. Gauthier as the member from Energy, Mines and Resources Canada during the year.

Based on the same guidelines as for the Steering Committee, the provincial side resumed the chairmanship for fiscal year 1984/85. Mr. Barlisen chaired the two meetings held during the reporting period. Mr. W. Watters of the Manitoba Department of Natural Resources served as secretary.

II.4 Membership: Studies Sub-Committee

The membership of the Studies Sub-Committee during the reporting year was as follows:

Canada

Mr. H. Naik (Co-Chairman)
Senior Water Resources Planner
Water Planning and Management Branch
Western and Northern Region
Environment Canada
Regina, Saskatchewan

Manitoba

Mr. F. P. Barlisen (Co-Chairman)
Head
Flood Damage Reduction Section
Water Resources Branch
Department of Natural Resources
Winnipeg, Manitoba

Dr. H. Schellenberg
Agricultural Resource Economist
Department of Agriculture
Winnipeg, Manitoba

Based on the same guidelines as those for the Steering Committee, the federal side resumed the chairmanship for the fiscal year 1984/85. There were no meetings held during the reporting period.

II.5 Membership: Technical Sub-Committee on Flood Forecasting

The following was the membership of the Flood Forecasting Sub-Committee for the report year:

Canada

Mr. D. R. Kimmett (Co-Chairman)
Regional Chief
Water Resources Branch
Environment Canada
Winnipeg, Manitoba

Mr. R. Raddatz
Scientific Services Meteorologist
Scientific Services Division
Atmospheric Environment Service
Environment Canada
Winnipeg, Manitoba

Manitoba

Mr. V. M. Austford (Co-Chairman)
Chief of Hydrotechnical Services
Water Resources Branch
Department of Natural Resources
Winnipeg, Manitoba

Mr. R. J. Bowering
Head
Hydrology Section
Water Resources Branch
Department of Natural Resources
Winnipeg, Manitoba

Mr. Kimmett was chairman during the 1984/85 fiscal year. Six meetings were held in Winnipeg during the reporting period. Mr. G. McCulloch of the Water Resources Branch, Environment Canada, acted as secretary.

CHAPTER III

PROGRAM IMPLEMENTATION

III.1 Scope

Originally, flood risk maps and flood damage reduction studies were to be prepared for 45 communities in Manitoba as listed in Schedule A of the Agreement Respecting Flood Risk Mapping (this schedule with amendments and additions is shown as Appendix A of this report). A location map is attached as Appendix B. However, Canada and Manitoba signed an agreement on March 10, 1983 under which they have agreed to share the cost of upgrading existing dyking systems to the one percent protection level in eight of these communities. Therefore, mapping or studies are not necessary for the communities of Emerson, Letellier, Dominion City, St. Jean Baptiste, Morris, Rosenort, Brunkild or St. Adolphe.

Flood risk areas are determined and plotted on detailed engineering maps and smaller scale public information maps. Policies which discourage further flood-prone development come into effect when the Minister of Environment for Canada and the Minister of Natural Resources for Manitoba designate the flood risk areas.

In communities where flood damage reduction studies are deemed necessary, an analysis is undertaken to determine the most economical and suitable measures to protect existing development from future flood damages. Agreements are negotiated to fund the construction of flood protection works, if such works are shown to be feasible and economically viable.

Improved flood forecasting procedures are being developed for the Red, Assiniboine and Souris rivers in Manitoba under the Flood Forecasting Agreement. This involves calibration of the HSPF hydrologic model on key tributaries of these rivers.

A Canada-Manitoba flood forecasting centre was established in Winnipeg as part of Phase One under the Agreement Respecting Flood Forecasting.

III.2 Schedule

During the first year of the Flood Damage Reduction Program, a community work program schedule was prepared for the 45 centres to be mapped, based on flood history, and recognizing the potential for future developments in undeveloped urban flood prone areas. Since then, the City of Winnipeg and the Additional Zone were added to Schedule A, the General Agreement was extended to 1990, the Mapping Agreement to 1984, the Studies Agreement to 1985, Phase One of the Flood Forecasting Sub-Agreement to 1984 and Phase Two to 1986. Further extensions to the General, Mapping and Studies agreements were requested in 1984/85.

III.3 Methodology

Flood Risk Mapping

The work program at each community for the flood risk mapping and flood damage reduction (FDR) studies begins with the preparation of 1:2000 scale topographic base maps showing planimetric and height information. Base map production is carried out in four steps, namely, aerial photography, control survey, aerial triangulation and map compilation.

Following the map preparation, hydrologic studies are undertaken to determine the magnitude of the design flood and the watershed's response to flood-generating events. The results of these studies function as an input to the hydraulic studies which systematically define design flood water surface profiles throughout the communities. The resulting flood risk lines are delineated on the base maps which are then used for engineering and planning purposes.

The Steering and Technical committees consult with the local government officials, to ensure a local awareness of the intent and implications of the program. They also review the delineation of the flood lines with the local officials to seek their support in the implementation of the policies of the program.

When the Steering Committee has concurred in the delineation of the flood risk area and floodway (where applicable), the preliminary flood lines, which are plotted on the 1:2000 scale maps, are presented to the local councils for their comments. The Ministers are then asked for their approval of the designation. The production of the public information map follows.

The public information program is conducted concurrently with the mapping process. Floodplain residents and the remainder of the community are made aware of the Flood Damage Reduction Program through meetings, brochures, maps and the media.

Flood Damage Reduction Studies

Flood damage reduction studies are undertaken for selected communities. The purpose is to determine the measure which has the most favourable benefit-cost ratio for minimizing flood damage potential of existing development and also to guide future floodplain development practices. The studies describe present land uses, assess potential flood damages and identify and evaluate alternatives for reducing the potential for flood damage. Among the range of measures considered are structural and non-structural alternatives such as dyking, flood proofing, flood forecasting systems, emergency action and zoning. Zoning and formulation of by-laws for flood prone lands at the local government level are encouraged by program officials.

In a community where a dyke exists, the flood damage reduction study would include a geotechnical study of the dyke to assess the dyke's stability and to determine the requirement, if any, for upgrading the dyke to a standard acceptable under the Flood Damage Reduction Program. A survey by questionnaire or some other means would be undertaken in some communities where a recent large flood occurred. This survey would be conducted to determine the exact extent of damage caused by that flood. The results can be used to estimate the damages that would be caused by other floods up to the design flood. Additionally, a field survey is conducted in most communities to determine the first floor elevations of all structures in the flood risk area. The study report is used as the basis for a recommendation to governments on construction of flood mitigation works or implementation of non-structural measures such as purchase of flood-prone properties.

Flood Forecasting

The Flood Forecasting Program is divided into two phases. In Phase I, which was completed on February 3, 1984, a pilot project was undertaken on the Boyne River watershed. This pilot project consisted mainly of a review of streamflow simulation models and testing and evaluation of the most promising models on the Boyne River. Results of the detailed testing were analyzed and forecast accuracies were compared to current methods. The applicability of the models to other watersheds in the Assiniboine, Red and Souris river basins was assessed to ensure that the selected model could be used throughout the study area. Other work in Phase I included establishment and testing of a real time hydrometeorological data acquisition system, an evaluation of stream channel routing procedures and the formal establishment of the Canada-Manitoba Flood Forecasting Centre. Phase II provides for the application of the HSPF streamflow simulation model to six high priority basins within the Assiniboine, Red and Souris river watersheds.

III.4 Work Assignments

All work activities under the Flood Damage Reduction Program are conducted under the general direction of the Steering Committee. The Flood Risk Mapping Technical Committee, the Studies Sub-Committee and the Flood Forecasting Sub-Committee supervise the work in their respective programs, and report to the Steering Committee on progress of work and on major issues.

The 1:2000 base maps and smaller scale public information maps have been compiled by private contractors. The inspection responsibility has been vested in the Director of Topographical Survey Division, Surveys and Mapping Branch of the Federal Department of Energy, Mines and Resources with the exception of the inspection of the aerial photography and survey control which, de facto, has been the responsibility of the Surveys and Mapping Branch of the Manitoba Department of Natural Resources. The Manitoba Surveys and Mapping Branch also has been responsible for the administration of tender invitation and awarding all contract work in accordance with the provincial contracting policies and the FDR Mapping Agreement.

The Water Resources Branch of the Manitoba Department of Natural Resources (MWRB) conducts all of the hydrologic and the majority of the hydraulic studies. In 1984/85, the hydraulic study for the Town of Neepawa was continued by Environment Canada, Ottawa. The MWRB is responsible for the administration of hydraulic study contracts. Cross-section surveys of the river channels are undertaken by the Engineering and Construction Branch of the Manitoba Department of Natural Resources.

The MWRB and Environment Canada, Regina, jointly conduct the public information program. Public Information Services of the Manitoba Department of Natural Resources plays an important role in this program by preparing brochures for each community, liaising with local officials,

arranging meetings with local councils and the public, preparing publicity for meetings, and providing information to all government agencies and municipalities on the implications of the Flood Damage Reduction Program.

The MWRB plays the lead role in the forecasting studies under the Flood Forecasting Program. The Inland Waters Directorate and the Atmospheric Environment Service of Environment Canada, Winnipeg play the lead role in testing the real-time hydrometeorological data acquisition system. The Water Planning and Management Branch of Environment Canada in Ottawa is evaluating the applicability of dynamic channel routing on the Red River in Manitoba.

The Manitoba Department of Natural Resources provides the initial funding for the program and submits statements to Environment Canada for cost-sharing. Under the supervision of the Technical Committee, the MWRB is responsible for the overall administration of all contracts under the Flood Damage Reduction Program.

III.5 Expenditures

The Flood Risk Mapping Agreement originally provided for a total expenditure of \$700,000 over five years. The Amending Agreement provided an additional \$1,490,000 to complete most of the required mapping. An additional \$160,000 was requested in 1984-85 under a further extension. A total of \$310,000 is available for flood damage reduction studies under the Studies Agreement. A total of \$600,000 has been allocated to implement the Flood Forecasting Sub-Agreement.

Expenditures from December 20, 1976 to March 31, 1985 are summarized in Table I. These costs were shared equally by Canada and Manitoba.

CHAPTER IV

ACTIVITIES UNDER THE FLOOD DAMAGE REDUCTION AGREEMENTS 1983-84

IV.1 Flood Risk Mapping Program

Designation

The most significant events in the year involved the final designations along the Boyne River in the Town of Carman and along the Seine River in the community of Lorette in the R.M. of Tache. The 100-year flood was used to delineate the flood risk areas. The following designations have been made previously by Manitoba and Canada:

Melita	-	Interim	-	December 20, 1979
Wawanesa	-	Interim	-	December 20, 1979
Winnipeg	-	Interim	-	February 15, 1980
Souris	-	Final	-	October 1, 1980
Elie	-	Final	-	November 5, 1980
Brandon	-	Final	-	March 26, 1982
Starbuck	-	Final	-	November 26, 1982
Sanford	-	Final	-	November 26, 1982
La Salle	-	Final	-	November 26, 1982
Swan River	-	Final	-	May 11, 1982
Dauphin	-	Final	-	February 15, 1984

Arborg: Icelandic River

A meeting was held with the Council of the Village of Arborg to explain the final flood lines. Work has begun on a public information map and brochure.

Carman: Boyne River

The flood risk areas at Carman were designated on June 13, 1984. A public information map and brochure were distributed to the residents.

Elie: La Salle River

A review of the hydrology study at Elie has resulted in a lower design flow for some of the designated flood risk areas. Officials of the R.M. of Cartier, in which the community of Elie is situated, were notified of this change and the somewhat lower land fill requirements for new construction in the floodway fringe area.

Fisher Branch: Fisher River

Work continued on the hydraulic study by the MWRB. A meeting was held on September 5, 1984 with the Council of the L.G.D. of Fisher, in which the community of Fisher Branch is located, to explain preliminary study results.

Gimli: Gimli Airport drain

No work was done during the period of this report.

Gladstone: Whitemud River

Work continued on the hydraulic study by the MWRB. Meetings were held with the Council of the Town of Gladstone on November 5, 1984 and January 22, 1985 to convey the preliminary results and to review the flood risk maps.

Grande Pointe: Seine River

No work was done at this community during the period of this report..

Gretna: Pembina River

No work was done during the period of this report.

La Riviere: Pembina River

No work was done during the period of this report.

Lorette: Seine River

The flood risk areas at Lorette were designated on September 13, 1984. A public information map and brochure were distributed to the residents.

MacGregor: Beaver Creek

No work was done during the period of this report.

Melita: Souris River

Interim designation has been in effect since December 20, 1979 on a one zone basis. No work was done towards final designation during the period of this report.

Minnedosa: Little Saskatchewan River

Work continued on the hydraulic study. A meeting was held with the Council of the Town of Minnedosa to explain the objectives of the Flood Damage Reduction Program.

Morden: Dead Horse Creek

Terms of reference were drafted for a flood damage reduction study. Plans for designation have been deferred until after this study is completed.

Neepawa: Whitemud River

Environment Canada is continuing the work on the hydraulic study.

Ochre River: Ochre River

No work was done during the period of this report.

Riverton: Icelandic River

The hydraulic study was completed by the MWRB. A meeting was held with the Council of the Village of Riverton on July 16, 1984 to explain the study results.

Ste. Anne: Seine River

No work was done during the period of this report.

Ste. Rose du Lac: Turtle River

No work was done during the period of this report. Plans are under way to include proposed improvements to existing flood protection works under the Canada-Manitoba Ring-Dyke Upgrading Agreement.

Souris: Souris River

No work was done during the period of this report. Plans are under way to include upgrading of the dyke protecting the water treatment plant at Souris under the Canada-Manitoba Agreement Respecting the Upgrading of Ring Dykes.

The Pas: Saskatchewan River

A meeting was held on October 3, 1984 to explain the Flood Damage

Reduction Program to the Council of the Town of The Pas. Work continued on the base mapping.

Virden: Bosshill, Gopher and Scallion creeks

Work continued on the base mapping.

Wawanesa: Souris River

Interim designation took place on December 20, 1979. No work was done towards final designation during the period of this report.

Westbourne: Whitemud River

No work was done during the period of this report.

Winnipeg: Red and Assiniboine rivers and tributaries

Work continued on the base mapping of the unmapped areas along the Assiniboine, La Salle and Red rivers within the city limits.

Woodside: Whitemud River

No work was done during the period of this report.

Remaining Communities

As was reported in past annual reports, no work is planned for Hartney, Horndean, Rosenfeld or Thompson because of the low flood potential. Also, flood risk mapping will not proceed at Brunkild, Dominion City, Emerson, Letellier, Morris, Rosenort, St. Adolphe and St. Jean Baptiste as an agreement was signed on March 10, 1983 between Canada and Manitoba to upgrade the level of protection offered by the existing dykes at these communities to conform to the one percent flood level. This level has been adopted as a minimum standard for the Manitoba FDR program.

Field Survey Checks of Topographic Mapping

A selected number of field survey checks was initiated by Energy, Mines and Resources Canada for some communities where topographic mapping has been completed. The objective of this exercise is to verify the accuracy of the mapping. The cost of this work is being borne by Energy, Mines and Resources.

IV.2 Flood Damage Reduction Studies Program

Terms of reference were drafted for flood damage reduction studies at Elie and Morden. Some data were gathered for examination of flood damage reduction alternatives at Elie, Morden and Riverton.

IV.3 The Flood Forecasting Agreement

Work continued on completing the report on Phase I of the Agreement. Phase II activities consisted of calibrating the HSPF model on tributaries of the Assiniboine, Red and Souris River watersheds. Modelling of Willow Creek near Chater was almost completed. Data files required for model calibration were being prepared for Gopher Creek and Elgin Creek.

Training activities and programming changes were carried out to facilitate the use of the MWRB mini computer for developing the flood forecasting capabilities. This is expected to result in large savings in computer operating costs.

The Ottawa office of the Inland Waters Directorate began applying the One-D hydrodynamic routing model to the Red River from Emerson to Winnipeg as part of a flow routing study. A meeting was planned between the Flood Forecasting Sub-Committee and the United States National Weather Service to explore the possibility of improving a co-operative data and flow forecasting exchange mechanism and to discuss directions on flow forecasting methodologies for the Red River.

TABLE I
CANADA-MANITOBA FLOOD DAMAGE REDUCTION PROGRAM
EXPENDITURES FOR 1977-83

	1977	1978/79	1979/80	1980/81	1981/82	1982/83	Total 1977/83
GENERAL AGREEMENT	\$ 1,000.00	\$ 1,254.91	--	\$ 478.10	\$ 664.88	\$ 42.00	\$ 3,439.89
General Mapping	--	19,083.18	19,067.79	46,784.60	38,534.97	71,081.64	194,552.18
Arborg	--	--	--	10,667.29	11,212.08	6,583.48	28,462.85
Assiniboine River	--	--	--	1,032.00	--	--	1,032.00
Brandon	--	--	81,502.96	75,457.90	32,798.75	4,131.64	193,891.25
Carman	17,082.12	21,957.83	6,577.98	23,815.41	15,361.80	389.38	85,184.52
Dauphin	--	--	19.70	39,746.68	34,095.53	11,161.48	85,023.39
Elie	22,817.76	27,270.36	6,798.22	9,040.40	487.05	174.91	66,588.70
Fisher Branch	--	--	--	8,802.96	12,838.20	12,806.15	34,447.31
Gimli	--	--	--	22.55	31,333.93	1,373.00	32,729.48
Gladstone	--	--	--	12,208.25	21,558.28	2,442.35	36,208.88
Grande Pointe	--	--	21.55	14,760.86	11,969.46	--	26,751.87
Gretna	--	--	--	414.00	17,943.40	365.00	18,722.40
Hartney	--	--	--	323.00	91.00	--	414.00
Horndean	--	--	--	403.00	91.00	--	494.00
La Riviere	--	--	--	251.00	31,189.27	4,339.96	35,780.23
La Salle	--	8,162.39	5,673.36	14,573.01	7,862.49	4,563.43	40,834.68
Lorette	--	--	--	624.55	21,910.29	18,293.59	40,828.43
MacGregor	--	--	--	6,092.13	28,415.53	1,850.47	36,358.13
Melita	8,806.00	9,536.44	2,102.46	10,172.60	56.42	430.78	31,104.70
Minnedosa	--	--	--	12,478.02	20,989.65	3,354.27	36,821.94
Morden	--	--	2,631.07	20,373.18	23,670.63	25,407.61	72,082.49
Neepawa	--	--	16,088.39	28,785.60	33,242.27	5,118.02	83,234.28
Ochre River	--	--	--	19,271.85	5,756.92	--	25,028.77
Ritchot	4,772.39	13,700.31	--	312.00	--	--	18,784.70
Riverton	--	--	--	6,052.92	15,129.77	4,483.00	25,665.69
Rosenfeld	--	--	--	427.00	14,350.09	253.00	15,030.09
Ste Anne	--	--	--	482.00	32,963.33	13,064.86	46,510.19
Ste Rose du Lac	--	--	14,219.19	16,657.66	12,273.59	4,860.16	48,010.60
Sanford	--	--	12,939.42	11,577.82	5,990.65	5,190.43	35,698.32
Souris	14,615.24	13,515.46	3,464.92	11,088.76	44.82	711.69	43,440.89
Starbuck	--	--	7,382.93	13,239.36	27,204.80	16,029.98	63,857.07
Swan River	--	--	--	17,206.72	17,851.50	9,370.26	44,428.48
The Pas	--	--	--	581.00	33,909.89	24,141.17	58,632.06
Thompson	--	--	--	433.00	14.00	--	447.00
Virden	--	--	--	146.00	38,866.04	13,250.51	52,262.55
Wawanesa	4,491.00	4,063.76	7,034.36	12,374.19	17.78	430.78	28,411.87
Westbourne	--	--	--	8,239.27	6,148.00	5,167.20	19,554.47
Winnipeg	--	37,563.98	47,660.87	9,585.35	3,461.52	4,724.14	102,995.86
Woodside	--	--	--	1,336.41	1,554.51	5,776.46	8,667.38
Brochure	3,500.00	--	--	--	--	--	3,500.00
TOTAL MAPPING	\$76,084.51	\$154,853.71	\$233,185.17	\$465,840.30	\$611,189.21	\$281,320.80	\$1,822,473.70
General Studies	--	--	2,177.48	--	2,452.70	8,082.01	12,712.19
Brandon	--	--	--	--	15,117.52	6,298.16	21,415.68
Carman	--	--	476.85	--	--	--	476.85
Gimli	--	--	--	--	2,817.49	60.00	2,877.49
Gladstone	--	--	--	--	--	299.61	299.61
Letellier	--	--	--	--	575.93	--	575.93
Morden	--	--	--	--	--	3,146.21	3,146.21
Morris	--	--	--	--	195.25	--	195.25
Ste Rose du Lac	--	--	--	3,982.87	8,826.82	1,215.20	14,024.89
Souris	--	--	--	--	4,389.62	1,215.20	5,571.77
Wawanesa	--	--	1,320.00	--	--	--	1,320.00
Winnipeg	--	--	4,368.65	261.08	361.98	--	4,991.71
TOTAL STUDIES	--	--	\$ 8,342.98	\$ 4,243.95	\$ 34,737.31	\$ 20,283.34	\$ 67,607.58
FLOOD FORECASTING	--	--	--	--	69,947.66	170,137.00	240,084.66
GRAND TOTAL	\$77,084.51	\$156,108.62	\$241,528.15	\$470,562.35	\$716,539.06	\$471,783.14	\$2,133,605.83

continued . . .

TABLE I (Continued)
CANADA-MANITOBA FLOOD DAMAGE REDUCTION PROGRAM
EXPENDITURES FOR 1983-85

	1983/84	1984/85	1977/85 Total
GENERAL AGREEMENT	\$ -	\$ -	\$ 3,439.89
General Mapping	56,429.23	39,223.22	293,844.45
Arborg	12,548.35	758.14	41,769.34
Assiniboine River	-	-	1,032.00
Brandon	1,454.00	-	195,345.25
Carman	810.00	6,316.15	92,310.67
Dauphin	8,732.03	6,099.25	99,854.67
Elie	1,357.25	-	67,945.95
Fisher Branch	19,683.03	7,812.66	61,943.00
Gimli	-	-	32,729.48
Gladstone	5,073.58	10,731.74	52,014.20
Grande Pointe	2,006.97	-	28,758.84
Gretna	-	-	18,722.40
Hartney	-	-	414.00
Hornbeak	-	-	494.00
La Riviere	-	-	35,780.23
La Salle	72.48	-	40,907.16
Lorette	6,809.60	4,235.61	51,873.64
MacGregor	29.97	-	36,388.10
Melita	-	-	31,104.70
Minnedosa	544.21	12,343.65	49,709.80
Morden	27,302.71	4,115.90	103,501.10
Neepawa	561.33	28,840.80	112,636.41
Ochre River	199.30	-	25,228.07
Ritchot	-	-	18,784.70
Riverton	16,382.52	9,119.84	51,168.05
Rosenfeld	-	-	15,030.09
Ste. Anne	319.42	-	46,829.61
Ste. Rose du Lac	-	-	48,010.60
Sanford	72.46	-	35,770.78
Souris	-	-	43,440.89
Starbuck	1,651.61	-	65,508.68
Swan River	6,182.67	-	50,611.15
The Pas	18,866.90	-	77,498.96
Thompson	-	-	447.00
Virden	7,547.42	-	59,809.97
Wawanesa	-	-	28,411.87
Westbourne	3,505.82	-	23,060.29
Winnipeg	9,624.95	-	112,620.81
Woodside	-	-	8,667.38
Brochure	-	-	3,500.00
TOTAL MAPPING	\$207,767.81	\$129,596.96	\$2,163,478.29
General Studies	\$ -	\$ 8,691.18	\$ 20,155.83
Brandon	-	-	21,415.68
Carman	-	-	476.85
Elie	-	3,657.17	3,657.17
Gimli	-	-	2,877.49
Gladstone	-	-	299.61
Letellier	-	-	575.93
Morden	411.55	7,371.52	10,929.28
Morris	-	-	195.25
Riverton	-	6,848.73	6,848.73
Ste. Rose du Lac	-	-	14,024.89
Souris	-	-	5,571.77
Wawanesa	-	-	1,320.00
Winnipeg	-	-	4,991.71
TOTAL STUDIES	\$ 411.55	\$ 26,568.60	\$ 93,340.19
Flood Forecasting			
- Phase I	\$109,858.63	\$ -	\$ 353,610.77
- Phase II	15,887.29	118,349.63	134,236.92
TOTAL FLOOD FORECASTING	\$125,745.92	\$118,349.63	\$ 487,855.69
GRAND TOTAL	\$333,925.28	\$274,515.19	\$2,748,114.06

APPENDIX "A"

AREAS AND FLOODWAYS TO BE MAPPED IN THE PROVINCE OF MANITOBA

PLACE	BODY OF WATER	WHETHER FLOODWAY IS TO BE DELINEATED
Brandon and R.M. of Cornwallis	Assiniboine River from west of 21-10-19 W.P.M. to east of 19-10-18 W.P.M.	No
R.M. of Portage la Prairie, R.M. of St. Francois Xavier, R.M. of Cartier and the City of Winnipeg	Assiniboine River from Portage la Prairie to the western limit of the City of Winnipeg	No
Carman and R.M. of Dufferin	Boyne River from west of 23-6-5 W.P.M. to east of 29-6-4 W.P.M.	Yes
Gimli and R.M. of Gimli	Overflows from the Gimli Airport Drain. Area to be mapped to be shown on location plan.	Yes
Thompson and L.G.D. of Mystery Lake	Burntwood River (to be shown on location plan)	No
Fisher Branch and L.G.D. of Fisher	Fisher River from west of 14-24-2 W.P.M. to east of 24-24-2 W.P.M.	Yes
Arborg and R.M. of Bifrost	Icelandic River from west of 22-22-2 E.P.M. to east of 24-22-2 E.P.M.	Yes
Riverton and R.M. of Bifrost	Icelandic River from south of 17-23-4 E.P.M. to north of 21-23-4 E.P.M.	Yes
Rosenort and R.M. of Morris	Morris River from south of 6-6-1 E.P.M. to north of 7-6-1 E.P.M.	No
Brunkild and R.M. of MacDonald	Morris River from south of 19-7-1 W.P.M. to north of 30-7-1 W.P.M.	No
Minnedosa and R.M. of Minto	Minnedosa River from west of 3-15-18 W.P.M. to north of 1-15-18 W.P.M.	Yes

PLACE	BODY OF WATER	WHETHER FLOODWAY IS TO BE DELINEATED
Ochre River and R.M. of Ochre River	Ochre River from south of 9-24-17 W.P.M. to north of 15-24-17 W.P.M.	Yes
Gretna and R.M. of Rhineland	Pembina River (in 5-1-1 W.P.M.)	Yes
La Riviere and R.M. of Pembina	Pembina River from west of 25-3-10 W.P.M. to south of 19-3-9 W.P.M.	No
Emerson and R.M. of Montcalm and R.M. of Franklin	Red River from International Boundary to north of 12-1-2 E.P.M.	No
Letellier and R.M. of Montcalm	Red and Aux Marais Rivers from south of 18-2-2 E.P.M. to east of 20-2-2 E.P.M.	No
Morris and R.M. of Morris	Red and Morris Rivers from east of 35-4-1 E.P.M. to east of 2-5-1 E.P.M.	No
St. Jean Baptiste and R.M. of Montcalm	Red and Plum Rivers from south of 36-3-1 E.P.M. to north of 1-4-1 E.P.M.	No
R.M. of Ritchot and the City of Winnipeg	Red River from southern limit of R.M. of Ritchot to Red River Floodway Control Structure	Yes
Elie and R.M. of Cartier	La Salle River from north of 11-11-3 W.P.M. to south of 2-11-3 W.P.M.	Yes
Starbuck and R.M. of MacDonald	La Salle River from west of 26-9-2 W.P.M. to east of 25-9-2 W.P.M.	Yes
Sanford and R.M. of MacDonald	La Salle River from north of 30-8-1 E.P.M. to south of 29-8-1 E.P.M.	Yes
R.M. of Ritchot, R.M. of MacDonald and the City of Winnipeg	La Salle River from east of 32-8-2 E.P.M. to Red River	Yes
Dominion City and R.M. of Franklin	Roseau River from north of 19-2-3 E.P.M. to east of 20-2-3 E.P.M.	No
The Pas and L.G.D. of Consol	Saskatchewan River Pasquia River to Rahl's Island	Yes
Grande Pointe and R.M. of Ritchot	Seine River from Grande Pointe (west of 20-9-4 E.P.M.) to Red River Floodway	Yes

PLACE	BODY OF WATER	WHETHER FLOODWAY IS TO BE DELINEATED
Lorette and R.M. of Tache	Seine River from west of 8-9-5 E.P.M. to the quarter section line of 9-9-5 E.P.M.	Yes
Ste. Anne	Seine River within the village of Ste. Anne	Yes
Winnipeg	Sturgeon Creek from P.T.H. No. 101 to Assiniboine River	No
Melita and R.M. of Arthur	Souris River from west of 31-3-26 W.P.M. to east of 6-4-26 W.P.M.	No
Hartney and R.M. of Cameron	Souris River from Hartney Dam to west of 17-6-23 W.P.M.	No
Souris and R.M. of Glenwood	Souris River from south of 33-7-21 W.P.M. to one half mile east of P.R. 250	No
Wawanesa and the R.M. of Oakland	Souris River from west of 23-7-17 W.P.M. to east of 26-7-17 W.P.M.	No
Swan River and R.M. of Swan River	Swan River from south of 26-36-27 E.P.M. to east of 28-36-27 W.P.M.	Yes
Ste. Rose du Lac and R.M. of Ste. Rose	Turtle River from Ste. Rose Dam to north of 8-24-15 W.P.M.	Yes
Dauphin and R.M. of Dauphin	Vermillion River from quarter section line of 4-25-19 W.P.M. to north of 15-25-19 W.P.M.	Yes
Gladstone and R.M. of Westbourne	Whitemud River from west of 30-14-11 W.P.M. to east of 32-14-11 W.P.M.	Yes
Westbourne and R.M. of Westbourne	Whitemud River from P.T.H. No. 4 to north of 25-13-9 W.P.M.	Yes
Woodside and R.M. of Westbourne	Whitemud River from west of 16-14-10 W.P.M. to east of 9-14-10 W.P.M.	Yes
Neepawa and R.M. of Langford	Whitemud River from southern Town Limit to north of 34-14-15 W.P.M.	No
Morden and R.M. of Stanley	Dead Horse Creek from Morden Dam to north of 8-3-5 W.P.M.	Yes
Virden and R.M. of Wallace	Gopher Creek from north of 27-10-26 W.P.M. to south of 15-10-26 W.P.M.	Yes

PLACE	BODY OF WATER	WHETHER FLOODWAY IS TO BE DELINEATED
Horndean and R.M. of Rhineland	Hespeler Channel from quarter section Line of 9-3-2 W.P.M. to quarter section line of 10-3-2 W.P.M.	Yes
Rosenfeld and R.M. of Rhineland	Overflows from Hespeler Channel. Area to be mapped to be shown on location plan	Yes
MacGregor and R.M. of North Norfolk	Beaver Creek. Area to be mapped to be shown on location plan	Yes
Winnipeg and Additional Zone	Red and Assiniboine Rivers and Tributaries	Yes

